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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/023,137	12/17/2001	Nathan D. Cahill	83512THC	4712

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EXAMINER
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YODER III, CHRISS S

ART UNIT	PAPER NUMBER
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2622

DATE MAILED: 06/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/023,137	CAHILL ET AL.	
	Examiner	Art Unit	
	Chriss S. Yoder, III	2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2006.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-13,15 and 17-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,6-13,15,17,19,20 and 22-24 is/are rejected.
- 7) ☒ Claim(s) 18 and 21 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments, see page 14, paragraph 6, filed March 29, 2006, with respect to the rejection(s) of claim(s) 1 and 19 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440).

The new grounds of rejection can be found below.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-3, 6, 7, 13, 15, 17, 19-20, and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440).
2. In regard to claim 1, note Szeliski discloses the use of a method for producing a composite digital image, comprising the steps of providing a plurality of partially overlapping source digital images having pixel values that are linearly or logarithmically related to scene intensity, wherein the source images have overlap regions wherein pixels of the images correspond in scene content and differing in scene content outside

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said overlap regions (figure 1:  $I_0-I_k$ ), determining the focal length of the source digital images from one or more sets of corresponding pixel values of the source digital images in said overlap regions (column 15, line 65 - column 16, line 62; and figure 1:110), and combining adjusted source digital images to form a composite digital image by blending said overlap regions (column 30, lines 20-30; the two images are blended to create a mosaic image after other processing/adjustments have been performed).

Therefore, it can be seen that the Szeliski device fails to disclose that the adjustments that are performed on the images include computing from the determined focal length, a radial exposure transform to compensate for exposure fall off as a function of the distance of a pixel from the center of the digital image and modifying the source digital images by applying a radial exposure transform to one or more of the source digital images to produce adjusted source digital images.

Toyoda discloses the use of the focal length to determine the radial transform for the correction of exposure falloff (column 1, lines 49-52, the marginal attenuation is considered exposure falloff; column 10, line 17-column 11, line 55; the focal length is used to compensate for marginal attenuation in the image). Toyoda teaches that the use of the focal length to determine the radial transform for the correction of exposure falloff is preferred in order to eliminate the need for a lens system having a complicated arrangement that is typically needed to correct for exposure falloff (column 1, lines 62-67). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to use focal length determined by Szeliski to determine the radial

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transform for correction of exposure falloff, as suggested by Toyoda, in order to edit the image without the use of heavy / large lens systems.

3. In regard to claim 2, note Szeliski discloses the a step of applying a linear exposure transform to one or more of the source digital images prior to combining the adjusted source digital images to produce adjusted source digital images having pixel values that closely match in an overlapping region (column 30, lines 20-30; the two images are blended to create a mosaic image).

4. In regard to claim 3, note Toyoda discloses that the radial exposure transform includes a  $\cos^4$  dependence on the distance from the center of the image (column 1, lines 46-52; the vignetting is influenced by the  $\cos^4$  law of illumination).

5. In regard to claim 6, note Szeliski discloses that the combining step includes calculating an average of the pixel values in the overlapping region (column 30, lines 20-30).

6. In regard to claim 7, note Szeliski discloses transforming the pixel values of the composite digital image to output device compatible color space (column 9, lines 31-35).

7. In regard to claim 13, note Toyoda discloses the storage of the transform information (column 9, lines 45-48). Therefore, it can be seen that the primary reference of Szeliski in view of Toyoda fails to disclose the use of metadata stored with the image to store the radial transform. Official notice is taken that the concepts and advantages of storing additional image parameters and camera settings as metadata are notoriously well known and expected in the art. Therefore, it would have been

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obvious to one of ordinary skill in the art to modify the primary device to include the use of metadata to store the radial transform in order to store the associated data together for better organization as well as to keep related data together in instances such as data transfer from one device to another.

8. In regard to claim 15, note the primary reference of Szeliski in view of Toyoda discloses the use of a method for producing a composite digital image as claimed in claim 1. Therefore, it can be seen that the primary reference fails to disclose that the radial exposure transform is calculated using a flash indicator. Official notice is taken that the concepts and advantages of using a flash indicator to calculate the radial exposure transform are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a flash indicator to calculate the radial transform in order to compensate for flash falloff.

9. In regard to claim 17, note Szeliski discloses the use of a computer program product comprising computer readable storage medium having a computer program stored thereon for performing the method of claim 1 (column 7, lines 46-51).

10. In regard to claim 19-20, these are apparatus claims, corresponding to the method of claims 1-2. Therefore, claims 19-20 have been analyzed and rejected as previously discussed with respect claims 1-2.

11. In regard to claim 22, note Toyoda discloses that the determining step further comprises analyzing the exposure falloff in at least one of said overlap regions (column

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10, line 17-column 11, line 55; the focal length is used to analyze the image for marginal attenuation in order to compensate the image and reduce the effects of falloff).

12. In regard to claim 23, note Szeliski discloses the use of a method for producing a composite digital image, comprising the steps of providing a plurality of partially overlapping source digital images, each said source digital image having an array of pixels, said pixels having values that are linearly or logarithmically related to scene intensity, said source digital images having overlap regions wherein pixels of said source digital images correspond in scene content, said source digital images differing in scene content outside said overlap regions (figure 1:  $I_0-I_k$ ), determining the focal length of the source digital images from one or more sets of corresponding pixel values of the source digital images in said overlap regions (column 15, line 65 - column 16, line 62; and figure 1:110), a step of applying a linear exposure transform to one or more of the source digital images prior to combining the adjusted source digital images to produce adjusted source digital images having pixel values that closely match in an overlapping region (column 30, lines 20-30; the two images are blended to create a mosaic image), and combining adjusted source digital images to form a composite digital image by blending said overlap regions (column 30, lines 20-30; the two images are blended to create a mosaic image after other processing/adjustments have been performed).

Therefore, it can be seen that the Szeliski device fails to disclose that the adjustments that are performed on the images include computing from the determined focal length, a radial exposure transform to compensate for exposure fall off as a

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function of the distance of a pixel from the center of the digital image and modifying the source digital images by applying a radial exposure transform to one or more of the source digital images to produce adjusted source digital images.

Toyoda discloses the use of the focal length to determine the radial transform for the correction of exposure falloff (column 1, lines 49-52, the marginal attenuation is considered exposure falloff; column 10, line 17-column 11, line 55; the focal length is used to compensate for marginal attenuation in the image). Toyoda teaches that the use of the focal length to determine the radial transform for the correction of exposure falloff is preferred in order to eliminate the need for a lens system having a complicated arrangement that is typically needed to correct for exposure falloff (column 1, lines 62-67). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to use focal length determined by Szeliski to determine the radial transform for correction of exposure falloff, as suggested by Toyoda, in order to edit the image without the use of heavy / large lens systems.

13. In regard to claim 24, this is an apparatus claim, corresponding to the method of claims 23. Therefore, claim 24 has been analyzed and rejected as previously discussed with respect claim 23.

14. Claims 4 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440) and "Reference Input/Output Medium Metric RGB Color Encodings".



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15. In regard to claim 4, note Szeliski discloses that the step of providing source digital images comprises capturing images and storing them in a digital memory (column 9, lines 13-18). Therefore, it can be seen that the primary reference of Szeliski in view of Toyoda fails to disclose that the transform is a metric transform that is scene independent.

“Reference Input/Output Medium Metric RGB Color Encodings” discloses the use of a metric transform that is applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent (found in the abstract, RIMM/ROMM is an metric encoding technique used to transform the source images; and in the first two paragraphs of the Introduction it can be seen that the image can be device dependent instead of scene dependent). “Reference Input/Output Medium Metric RGB Color Encodings” teaches that the use of a metric transform applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent is preferred in order to increase the dynamic range of the stored image in order to match a device (page 7: ERIMM RGB Color Encoding). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a metric transform that is applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent in order to increase the dynamic range of the stored image as suggested by “Reference Input/Output Medium Metric RGB Color Encodings”.

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16. In regard to claim 8, note "Reference Input/Output Medium Metric RGB Color Encodings" discloses that the metric transform includes a color transformation matrix (page 4: ROMM RGB Conversion Matrix- the transform uses a color transformation matrix).

17. In regard to claim 9, note "Reference Input/Output Medium Metric RGB Color Encodings" discloses that the metric transform includes a lookup table (page 2: Selection of Color Space- paragraph 2, "simple LUT-matrix-LUT transformation can be used").

18. In regard to claim 10, note Szeliski in view of Toyoda and "Reference Input/Output Medium Metric RGB Color Encodings" discloses the use of a method for producing a composite digital image as claimed in claim 4. Therefore, it can be seen that the primary reference fails to disclose that the metric transform is included as metadata with the corresponding source digital image. Official notice is taken that the concepts and advantages of storing information pertaining to the image as metadata is notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the storage of the metric transform as metadata in order to store the associated data together for better organization as well as to keep related data together in instances such as data transfer from one device to another.

19. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440) and Inoue et al. (US Patent # 5,083,209).

20. In regard to claim 11, note the primary reference of Szeliski in view of Toyoda discloses the use of a method for producing a composite digital image as claimed in claim 23. Therefore, it can be seen that the primary reference fails to disclose that the linear exposure transform is a function of the shutter speed used to capture the source digital image, and that the shutter speed is included as meta-data with the corresponding source digital image.

Inoue discloses the use of an exposure transform that is a function of the shutter speed used to capture the image (column 2, lines 9-12; and column 3, lines 7-16; the brightness is adjusted based on a function of shutter speed; the shutter speed is changed to obtain the desired brightness). Inoue teaches that the use of a transform that is a function of shutter speed is preferred in order to obtain the desired brightness values of the image (column 2, lines 9-12). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a transform that is a function of shutter speed as suggested by Inoue.

Official notice is taken that the concepts and advantages of storing additional image parameters and camera settings as metadata are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of metadata to store the shutter speed in order to store the associated data together for better organization as well as to

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keep related information together for instances such as data transfer from one device to another.

21. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440) and Hirai et al. (US Patent #6,603,928).

22. In regard to claim 12, note the primary reference of Szeliski in view of Toyoda discloses the use of a method for producing a composite digital image as claimed in claim 23. Therefore, it can be seen that the primary reference fails to disclose that the linear exposure transform is a function of the f-number used to capture the source digital image and that the f-number is included as meta-data with the corresponding source digital image.

Hirai discloses the use of an exposure transform that is a function of the f-number used to capture the image (column 2, lines 10-25; and column 3, lines 16-17; the f-number is used to compensate the image). Hirai teaches that the use of a transform that is a function of the f-number is preferred in order to correct image coloring to a desired value (column 2, lines 10-30). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a transform that is a function of the f-number as suggested by Hirai.

Official notice is taken that the concepts and advantages of storing additional image parameters and camera settings as metadata are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the

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art to modify the primary device to include the use of metadata to store the shutter speed in order to store the associated data together for better organization as well as to keep related information together for instances such as data transfer from one device to another.

### ***Allowable Subject Matter***

23. Claims 18 and 21 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

24. As for claims 18, the prior art does not teach or fairly suggest the use of a method for producing a composite digital image using the root of the function:

$$g(r) = I_1'' \cos^4 \left( \tan^{-1} \left( r^{-1} \sqrt{u_i^2 + v_i^2} \right) \right) - I_1' \cos^4 \left( \tan^{-1} \left( r^{-1} \sqrt{x_i^2 + y_i^2} \right) \right)$$

to calculate the focal length of the overlapping regions.

25. As for claims 21, the prior art does not teach or fairly suggest the use of a system for producing a composite digital image using the root of the function:

$$g(r) = I_1'' \cos^4 \left( \tan^{-1} \left( r^{-1} \sqrt{u_i^2 + v_i^2} \right) \right) - I_1' \cos^4 \left( \tan^{-1} \left( r^{-1} \sqrt{x_i^2 + y_i^2} \right) \right)$$

to calculate the focal length of the overlapping regions.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US006788333B1: note the use of a system for generating panoramic images.

US006256058B1: note the use of a system for generating panoramic images.

US006798923B1: note the use of a system for generating panoramic images.

US005444478A: note the use of a system for generating composite images.

US005706416A: note the use of a system for generating composite images.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chriss S. Yoder, III whose telephone number is (571) 272-7323. The examiner can normally be reached on M-F: 8 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CSY  
June 12, 2006

A handwritten signature in black ink, appearing to read 'Lin Ye', with a long horizontal flourish extending to the right.

LIN YE  
PRIMARY EXAMINER